# THE · EXTENSION PATHOLOGIST

A NEWS LETTER FOR EXTENSION WORKERS INTERESTED IN PLANT DISEASE CONTROL

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Dr. Charles Chupp, chairman of the Committee on Extension and Research, stated that the object of the meeting was to exchange ideas with regard to the success of various extension projects; to examine the methods used and to try to determine the reasons for success or failure as the case might be. He then introduced C. T. Gregory of Indiana as chairman of the afternoon session.

Dr. Gregory started out with an example of a project that failed mainly because of lack of scientific information. He said loose smut of wheat was very prevalent in Indiana and that treatment of seed with hot water was started about 1918. In 1919 some 8 central treating plants were operating and by 1924 there were 5,000 bushels of smut-free wheat available. However, it was found that the fields planted with this smut-free seed did not remain free from smut. Evidently smut blew in from neighborhood fields. Therefore the central treating plants, which had been extended to about 50 counties, were gradually abandoned. The problem was then attacked by attempting to establish a smut-free area. Such an area was finally developed to supply smut-free seed to other parts of the State. About the time the scheme started to work, the farmer leader of the group was killed and the group broke up for lack of a local leader. A similar area was established in southern Indiana on barley. It was successful until a severe winter killed all the barley making it necessary to go elsewhere for new seed.

As an example of a successful project which became established because of soundness of scientific information, Dr. Gregory cited the cabbage-yellows work. A survey in 1918 showed considerable loss from yellows. Resistant varieties from Wisconsin were obtained and planted out in demonstrations in the area concerned. At the present time over half the growers are using these varieties successfully, and the only work needed on this project is to write a few occasional news articles.

Dr. Gregory raised the question of how to get the last 50 percent of the farmers to adopt improved practices. He stated that the problem of getting the first 50 percent was not so difficult but to get the last half was certainly a problem. The opinion was expressed from the floor that it was not worth the time to attempt to get 100 percent of the farmers to adopt these practices. Others thought that we should continue to try until

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perhaps 75 percent were reached, and there were all degrees of opinions about this. There will always be a considerable percentage that will not progress unless they are given financial assistance or perhaps forced to improve. It does not seem as if the work of the Extension Service is done, however, until all farmers are reached.

Charles Chupp of New York pointed out the desirability of getting the assistance of others; in enlisting the cooperation of other specialists in putting across our work and cited his work with lettuce. In some parts of New York a large amount of lettuce is grown in cold frames, and Botrytis rot is an important factor in reducing profits. After observing conditions he found that control of the disease depended largely on the amount of soil and air moisture within the frames and that it was a question of how to reduce this moisture. It was discovered that the glass sash leaked badly and too much rain water was finding its way into the frame. They therefore experimented with larger glass panes in the sash and also with different slopes to regulate run-off. They found that larger panes were desirable and that when the back of the sash was raised $4\frac{1}{2}$ inches it permitted about three-fourths of the water to run off. The other fourth was about the right amount needed to water the bed.

One thing they found was that with many sashes and only a few men it was not possible to give the frames adequate ventilation. They therefore began thinking about an automatic sash lifter and enlisted the aid of the Rural Engineering Department. A system of flues for ventilating the beds, which makes it unnecessary to lift the sashes, is now being developed. These ventilating flues, made of wood, are about 4 feet high and come off the upper corner of the frame. This example of Dr. Chupp's illustrated the desirability of cooperation with other subject-matter departments and also the fact that extension men have to meet the problems as they find them in the best ways they can, often without the assistance of research workers.

A. L. Pierstorff briefly described the Ohio apple spray service as an example of a successful project. When he first came to Ohio in 1928 special spray service men were located in the fruit districts. He began to experiment with the radio with successful results. This has gradually developed into a very satisfactory medium for getting spray service information promptly to the apple growers. In the earlier days he depended on county agents to supply him with data and specimens, but now he uses practically all fruit growers. They know what is wanted and do a steady, conscientious job of supplying information on bud development by wire and of sending samples of old leaves and new growth by mail. Many of them are former students who have had courses in plant pathology.

He mentioned the fact that growers sometimes attempt to modify the spray recommendations and by so doing stand the chance of turning a successful project into an unsuccessful one.

Hot water treatment of barley seed had been demonstrated in Ohio but at the end of 3 years' work there was just as much loose smut as ever. Smut blew in from outside. Failure of this project was evidently due to its impracticability.

He mentioned the value of cooperating with other specialists, such as those in entomology, horticulture, and agronomy, as a means of putting the message across.

H. W. Rankin, formerly extension plant pathologist in Georgia but now in Pennsylvania, reported on work that he had formerly done in Georgia.

As an illustration of a project that failed he mentioned the sweet-potato disease control work that he started when he first went to the State. Georgia produces more sweetpotatoes than any other State, and disease losses are severe. On account of these facts Mr. Rankin thought a sweetpotato project was a good one to undertake, but he found that farmers did not come out to the meetings. They did not seem to be interested in sweetpotatoes, and on analyzing the situation he decided the reason was that in the earlier days when the cotton-boll weevil hit, farmers had turned to other crops, among which were sweetpotatoes. They had built a large number of curing houses and because these houses were not all properly constructed or managed there was naturally a great deal of spoilage. The storage-house project failed and farmers lost interest in the crop. This failure eventually resulted in the subsequent failure of Mr. Rankin's disease-control work with sweetpotatoes.

As an example of a successful project Mr. Rankin cited cottonseed treatment and germination work. The arrival of the boll weevil in Georgia resulted in new and earlier varieties of cotton being planted. This forced the picking season earlier with the result that the bolls opened earlier and during what was likely to be a rainy season. This resulted in seed infection with seed of low quality and of low germination during certain years. Mr. Rankin obtained seed samples from every county in the State, made germinations, and found a great deal of very low-germinating seed. He then mapped the State with regard to seed quality, and since the solution seemed to be selection of the better lots for seed purposes through the germination test, he took a homemade germinator to the counties and got people interested in germinating their seed. Community germination services were organized. Along with this went recommendations for seed treatment. The result of all the work was much more satisfactory seed and better stands and yields of cotton than would have resulted if this project had not been undertaken. It was successful because it met the needs, and the demonstrations showed that the practices were sound.

J. H. Muncie of Michigan reported regarding a committee of county agents which helps him work out the extension program in that State. This committee of five members is selected to represent regions of the State having different crops as their major ones.

After deciding upon a plan of work and the crop diseases to be stressed, conferences are held in the various counties with the county agricultural committee or with groups of leading growers. At these conferences the details of the county plant-disease work are discussed and programs for the year worked out.

The State committee has been helpful in determining work to be undertaken, because its members furnish first-hand information on disease conditions of a wide variety of crops. With this information well balanced State and county programs can be worked out.

O. C. Lee, specialist in weed control for Indiana, stated that he used county agent committees in his work. Each district has a weed committee composed of three agents who formulate a practical program for the district. The agents then carry this program back to their counties and appoint county weed committees made up principally of farmers. Mr. Lee stated that it was important to pay particular attention to the selection of the personnel of these local committees. The county committees also tie up with the county conservation committees and county agricultural planning committees. He finds this type of organization very satisfactory.

M. F. Barrus of New York reported on work with young people, particularly vocational agriculture students. He called attention to plant-disease judging contests that have been conducted during Farmers' Week at Ithaca and at the horticultural exhibits in eastern and western New York. The plan followed is to display numbered specimens on tables, and teams of two students from each school examine these specimens and make their identifications. Last year 143 contestants representing 75 schools took part during Farm and Home Week at Ithaca. Thirty-nine contestants from 13 schools participated at the Rochester Fruit Show, and 78 contestants divided among 17 teams were entered at the Kingston Fruit Show. This indicates a rather intense interest on the part of agricultural schools in this activity and it means that the teachers of these students must have considerable training in plant diseases and insect identification themselves. Fruit spray service men located in the counties as well as the extension plant pathologists help teachers acquire information in this subject.

There are two outstanding difficulties that need to be overcome in connection with this activity, according to Dr. Barrus. First, students learn control measures by memory and it is not fixed in their minds. Second, certain schools tend to win the prizes each year. Therefore new developments in the disease identification contests include tallying a certain number of apples for disease and insect injury in a given length of time, a series of questions that will make it necessary for students to reason out the answers, and changes in rules governing awards.

John O. Miller of Kansas reported on the 1937 oat-smut seed treatment campaign which followed the 1936 season of very high smut losses. Winter meetings were held in 26 counties, 171 seed treatment demonstration plots were put out, result demonstration meetings, crops tours, etc., were made during the summer. Result demonstration records were secured from 91 farms.

He then mentioned wheat seed treatment and stated that during the drought farmers neglected treating and that they are slow to get started again. Some centralized treatment has been tried but the results have not been very outstanding. As far as he knows there are no portable seed-cleaning and treating outfits operated in the State as yet but he thinks there is an opportunity for this and is interested in getting more information about it.

T. F. Manns of Delaware gives a small fraction of his time to extension work. He finds during recent months that agricultural high school teachers have more time for cooperation in plant-disease work than do many of the county agents. In his work on selection of sweetpotatoes for control of wilt he meets with the boys' classes and goes with them to some local sweetpotato grower's field that has been selected for demonstration. There the lesson is taught with the boys doing the work, and in the winter there is usually a follow-up meeting when the pictures of the boys in action are shown. This meeting brings out the boys and their parents and the subject is discussed again. The same method is followed with regard to grape spraying, tomato, and peach yellows work. Dr. Manns takes advantage of the enthusiasm of youth to get his work across.

R. C. Rose of Minnesota reported on a special phase of the seed-treating work in that State. In 1936, there were 65 seed-treating stations, mostly at elevators, that offered seed-treating service to grain growers at an average charge of 3 cents a bushel. In that year these stations treated more than 306,000 bushels of seed grain with the organic mercury dusts.

During the past year (1937), there was a marked decrease in the amount of seed-grain treated at many of these stations. This was apparently due to the fact that several new promising machines appeared on the market, and to a wide distribution of plans for building effective, inexpensive, home-made treaters that would save both labor and time. While a number of gravity oil-barrel treaters were constructed and put into use, the home-made Minnesota Seed Grain Treater seemed to have a greater appeal to most farmers.

The construction of this machine is described in mimeographed circulars that were distributed over the State early in 1937. In one county almost a hundred machines were built in a period of 2 or 3 months.

The cost of lumber and hardware used in building the machine is about \$3. The construction is so simple that anyone handy with tools should have no difficulty in making the machine. With this treater, two men should be able to treat and sack 50 to 60 bushels of seed per hour.

The meeting was concluded by Dr. R. S. Kirby of Pennsylvania showing his excellent series on natural-colored lantern slides illustrating symptoms of various fruit and vegetable diseases and diseases of ornamentals. He also showed a colored motion picture on fruit spraying work in Pennsylvania. These pictures in natural colors made a great impression on the group and it was easy to see how useful they would be in connection with meetings and classes.

The colored film used for both motion pictures and the small 1 x $1\frac{1}{2}$ inch slides was Kodachrome. An Eastman special was used for taking the motion pictures. A Leica Model G, Exakta, and an Argus were used for taking the small slide pictures.

POTATO SPRAY RINGS

For the past 10 years the number of potato spray rings in New York State has fluctuated between 44 and 52 rings, according to Dr. Charles Chupp, extension plant pathologist for that State. He says, however, that work in organization of these rings is really more productive of results than the number of rings would indicate. It often happens that a man who enters a ring becomes so firmly convinced that spraying pays that he finally buys a sprayer himself. This disrupts the old ring until a new member is found. Spray companies say that they sell twice as many sprayers in spray ring communities as they do in similar communities where rings have not been in operation.

Suggested procedure for examination of apple leaves to determine development of the scab fungus, (Venturia inaequalis) in connection with Ohio Fruit Spray Service

By

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The procedure outlined below is essentially that followed in the routine examination of old, scabbed apple leaves during the spring of 1937 to determine the seasonal development of the perithecia, asci, and ascospores of the apple scab fungus.

Preliminary procedure: It has been found convenient to open the envelopes containing leaves and to record the names of the cooperators, dates of collection, and approximate number of leaves in the samples on a blank sheet before beginning examination. This sheet is convenient for a temporary record of pertinent information on the development of the fungus and spore discharge in the moist chamber. By keeping the envelopes in the same order on the table, it is unnecessary either to mark the leaves or to place the cooperator's names on the petri dishes used in the test.

Procedure for examination of perithecia: The leaves in a given sample are sorted out on a paper. From 4 to 8 leaves, preferably with well-developed scab lesions, are then selected and spread out flat between two pieces of copper screening. Squares of screening $2\frac{1}{2}$ inches on a side are suitable for small leaves, and rectangular pieces, $2\frac{1}{2}$ x 3 inches, are more satisfactory for large ones. One or both ends of the screens are fastened together with paper clips. The screen packets are placed on top of the corresponding envelopes and after all are prepared, they are gathered in like order and placed in a decolorizing solution.

The solution for decolorizing the leaves sufficiently to permit inspection of the perithecia is prepared by placing from 400 to 500 cc of water in

a 600 cc Pyrex beaker and adding approximately 30 grams of granular sodium hydroxide. This solution is heated on an electric hot plate, and just before the boiling point is reached the packets of leaves are placed in the solution so that they stand edgewise, and allowed to boil from 10 to 15 minutes. From 8 to 10 packets of leaves may be decolorized at one boiling. After boiling the packets are removed in order with a pair of curved tweezers and placed in water in laboratory specimen dishes on top of the envelopes in which the specimens were received. The dark-brown coloring matter will diffuse from the leaves leaving them partly transparent.

After 10 to 15 minutes the clips are removed and the uppermost piece of screen lifted off. Except with badly matted or broken leaves, it is usually possible to pick up one leaf at a time and remove to petri dish halves. The leaves are then floated out by means of a small amount of water to a single thickness, drained, and either examined wet or allowed to dry somewhat in the air or on top of a hotplate for a few minutes before examination. The perithecia can be more readily removed from surrounding leaf tissue if the leaves have been allowed to become partially dry.

The decolorized leaves in petri dishes are examined under the binocular microscope to determine the percentage of perithecia that are full sized and to select certain of the full-sized ones to be transferred to glass slides for further inspection as to the stage of development of the asci and ascospores. Several counts of from 50 to 100 perithecia on different leaves are made during the early part of the season in order to determine the percentage that is full-sized; a single count of 50 perithecia has been considered sufficient during the remainder of the period. Several single perithecia may now be picked off partially dry, decolorized leaves rather rapidly with a hooked needle and transferred to a drop of water on a slide for examination. This method is helpful during the early stages of development when it is especially desired to determine when the first hyaline, and later the first mature, spores have developed inside the perithecia.

During the early part of the period, the above method is often supplemented by an examination of single perithecia picked off with a needle from unboiled but slightly moistened leaves. The unavoidable darkening of the mature ascospores which often results when leaves are boiled in a sodium hydroxide solution is thereby avoided.

After development of the fungus has proceeded sufficiently so that practically all the perithecia contain either hyaline or mature spores to the extent of 50 percent or over, the following method is sufficiently accurate and has the added advantage that readings on a larger number of perithecia may be made in a given period of time: An area containing numerous, full-sized perithecia is located under the binocular microscope and a section of the surrounding leaf tissue is removed with a hooked needle. From 5 to 10 of such fragments from several leaves containing full-sized perithecia can be placed in drops of water on a single slide. A second slide is used in lieu of a cover glass because it covers all the fragments and is sufficiently rigid to permit pressure on top to break open the perithecia. The crushed perithecia are examined under the low power of a compound microscope with diaphragm open

so that sufficient light will pass through the leaf tissue surrounding the perithecia. By this method and the use of counters for keeping a record of perithecia containing mostly hyaline spores, mature spores, or those from which nearly all the mature spores have been discharged, it is possible to record data on from 20 to 75 perithecia within a few minutes.

Procedure for determining ascospore discharge in moist chamber.

At the time leaves from a given sample are prepared for decolorization, other leaves from the sample that show abundant scab lesions are selected for determining spore discharge in the moist chamber. From 1 to 4 leaves, or selected portions of leaves, are soaked in water in the same laboratory specimen dishes that are later used to clear the boiled leaves of sodium hydroxide solution. Wetting from 10 to 15 minutes is usually sufficient.

The spore traps are set up in the following manner: Two glass rods of small diameter and approximately 3 inches in length are placed in the bottom of a petri dish that has a diameter sufficient to allow two glass slides to be placed inside without overlapping. Both halves of the petri dish are atomized. A pair of slides is placed atop the glass rods and lightly atomized. Then a piece of one-fourth-inch-mesh hardware cloth, $2\frac{1}{2}$ inches square, is placed on top of the slides and the previously wetted leaves are spread evenly thereon. A second square of hardware cloth is laid on the leaves and a second pair of atomized slides is placed above the cloth. The slides may be inspected for spore discharge after from 3 to 4 hours during the period of greatest development, but during the early part of the season from 6 to 8 hours should elapse before the slides are examined under the low-power field. An atomized battery jar may be used to cover the petri dishes as an additional precaution against drying out of the leaves and slides. During the main part of the season, the use of only two slides placed above leaves held between two squares of hardware cloth is convenient and usually affords a satisfactory reading of spore discharge.

A variation of the previously outlined method that permits spore discharge over a larger area, that is rapidly set up, and that prevents desiccation of the ascospores during examination is given below: A support is made for the moistened leaves from a piece of hardware cloth $2\frac{1}{2}$ x 3 inches. The cloth is bent under one-half inch at an approximate right angle along the longer sides. The leaves are placed on top and a square of cloth placed above to prevent the wet leaves from sticking to the cover of the petri dish in which they are placed. The spores are discharged directly onto the inner surfaces of the atomized petri dish above and below. To make a reading, the support holding the leaves is removed, cover replaced, and the upper and lower surfaces of the petri dish inspected under the low power. This method is satisfactory provided one has petri dishes that have sufficiently plane surfaces to permit rapid examination without constantly changing the focus of the microscope. In our work it has been customary to count spores in from 5 to 10 fields of the microscope unless only a smaller number of fields containing spores can be located. It has been considered sufficiently accurate to estimate the approximate number of ascospores in a given field and to record

the data in units of five spores. The average spore discharge per low-power field for a given sample of leaves is readily determined from the above figure.

NEW YORK POTATO SCAB PROGRAM

The most important potato disease subproject was the one dealing with control of tuber defects. The various steps included in the work are based on the facts which our departmental investigators discovered recently or which their work has emphasized as of importance. Among such facts are the following:

1. All mercury compounds, organic or inorganic, when added to scab-infested soil, increase the percentage of scab in most up-State locations where tried, but have proved successful in controlling scab in certain locations on Long Island.

2. In soils where scab does not affect the tubers, mercury compounds, especially yellow oxide of mercury, used for seed treatment or placed with the fertilizer, generally reduces all types of Rhizoctonia injury.

3. When yellow oxide of mercury is used for seed treatment, it should be in a dilute suspension of 1 pound in 30 gallons of water.

4. Formaldehyde treatment, hot, cold, or in dust form, reduces the percentage of scab on the harvested tubers.

5. In some soils, not too nearly alkaline and where the buffer reaction is not too great, the application of 200-600 pounds an acre of sulphur to the soil helps materially to reduce scab. The effect, however, must be tested on nearly every individual farm before accurate recommendations can be made.

6. The buffer reaction in muck soils is so great that sulphur is of no value there for controlling scab.

7. Sulfate of ammonia, being quickly soluble, is probably of greater value in reducing scab than are corresponding amounts of sulphur.

8. In community treating vats, the strength of the formaldehyde is not reduced at a uniform rate, but may vary too much for safety of the tubers or for control of scab.

9. The strength of the formaldehyde can be determined accurately by adding as an indicator a small amount of rosolic acid solution and titrating with normal HCL. (Ext. Path. 29:39-41. Oct. 1937)

10. On some farms there is a wide range in the pH values of the soil. Therefore, the farmer sometimes can select field low enough in pH to control scab without the use of other methods.

11. Spraying plants heavily with bordeaux mixture while they are young delays tuber formation and thus reduces the percentage of scab.

All of the above points have been emphasized during the year by demonstrations, exhibits, meetings, news articles, and radio talks. The excellent cooperation of R. G. Palmer made it possible to continue the work on a fairly large scale in Monroe County. The results of 1935 were impressive enough so that county agricultural agents in nearly every county west of Syracuse carried on at least some parts of the program.

The changing from the older methods of potato-seed treatment to the newer ones is an excellent criterion of the effectiveness of extension work. A few years ago nearly all the treating was done with hot or cold corrosive sublimate. At present, formaldehyde is applied in the scab-infested areas and yellow oxide of mercury where Rhizoctonia is to be combated. The change has been somewhat as follows during the past 7 years:

Fungicide	1929 Bushels	1936 (incomplete) Bushels
*Corrosive sublimate	183,738	25,000
Calomel	14,100	1,300
Yellow oxide	0	88,000
Semesan Bel	47,625	5,640
*Formaldehyde	Almost none	60,000

*These potatoes treated mostly in community vats.

In the formaldehyde treatment, it is important that the strength of the solution be tested at frequent intervals. Formerly there was no test which could be used successfully in the field. Therefore two chemists were assigned by manufacturers of formaldehyde to develop a suitable test. The test they finally discovered was used satisfactorily in two counties in 1936, and probably will be employed generally at all community treating vats in 1937.

Members of the Rural Engineering Department have been requested to build some simple device which can be attached to a tank and which automatically makes the tests, so that farmers can see at a glance the temperature and strength of the solution in which their potatoes are treated. The apparatus has not yet been perfected but rather encouraging progress has been made.

---Charles Chupp, Extension Plant Pathologist,
New York State College of Agriculture,
Annual Report, 1936.

THE EXTENSION PROGRAM ON COTTON SEED TREATMENT IN NORTH CAROLINA

By Luther Shaw
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An extension program for the control of damping-off of cotton by treating the seed with ethyl mercury chloride dust (2 percent Ceresan) was started in North Carolina in 1936. At that time the value of cotton-seed treatment was not known to more than 100 farmers in the State, and not more than 8,000 bushels of approximately 1,250,000 bushels planted annually in the State had been treated any 1 year. Result demonstrations were emphasized in the 1936 program when a total of 67 demonstrations were conducted in 11 counties distributed through the major cotton belts. Improved stands as a result of damping-off control resulted in an average increased yield of 253 pounds of seed cotton per acre, valued at $13.35. The average cost of seed treatment was 27 cents per acre. Hence, seed treatment gave a profit of $13.08 per acre. The amount of seed treated in the State increased from approximately 8,000 bushels in 1935 to approximately 30,000 bushels in 1936. This increase was due, in part at least, to circularizing of county agents and farmers and a few meetings held on the subject.

In 1937 approximately 100 result demonstrations were started in about 40 counties. Farmer meetings were held in these counties and results of the 1936 demonstrations discussed. News articles were released from time to time. As a result of the publicity approximately 225,000 bushels of cotton seed were treated in the State in 1937. An average of 74 of the demonstrations completed to date shows an increased yield of 236 pounds of seed cotton per acre in favor of seed treatment.

PREDICTING BACTERIAL WILT OF SWEET CORN

That N. E. Steven's method of making forecasts for the incidence of bacterial wilt is being put to practical use is shown by the following statement by Charles Chupp of New York:

"The temperature records for December 1935, and January, February, and March, 1936, were obtained from the Weather Bureau, and a forecast was made from these that there would be little or no wilt present in up-State New York in 1936. Therefore it would be safe to plant susceptible early varieties if the grower desired. This forecast proved correct. The only wilt in the State was a trace on Long Island. This is the third year that forecasts have been made successfully."

CUCUMBER SEED TREATMENT

In all the winter meetings, in letters, radio talks, and news articles, the importance of seed treatment for cucurbits was stressed. Because of previous extension work, most of the men who contract pickle acreage treat the cucumber seed before it is given to the grower. This treatment is with corrosive sublimate, 1-1000, for 5 minutes. The seasons since 1931 having been dry, scab, angular leaf spot, and anthracnose have been absent. It therefore is more difficult to get individual growers to do this treating. In Albany and Niagara Counties some of the seed was treated during community meetings.

After treatment with corrosive sublimate, the recommendations are that all cucurbit seed be treated with red copper oxide for damping-off, or the soil be treated with a very mild dosage of formaldehyde (2.5 tablespoonfuls for each bushel of soil). There are no accurate data as to how generally these recommendations were followed, but in 1935 the sale of red copper oxide for all vegetable- and flower-seed treatments increased 200 percent in the State and in 1936 almost 100 percent over 1935. Counting the 8,000 pounds used on peas, the total number reported sold in the State was approximately 12,000 pounds.

---Charles Chupp, Extension Plant Pathologist,
New York State College of Agriculture,
Annual Report, 1936.